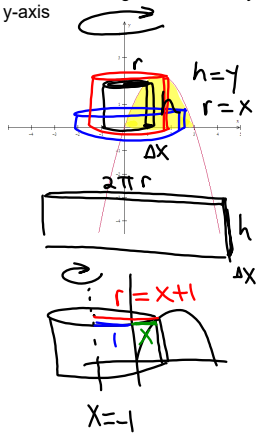
7.3b Volumes

cylindrical shells

Revolve the region bounded by y=3x-x^2 and the x-axis about the y-axis



$\Delta V = 2\pi r h \Delta x$

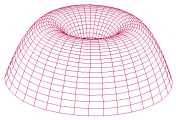
$\int_a^b 2\pi r h \, dx$ shells

$\int_0^3 2\pi \cdot x \cdot (3x-x^2)\, dx$

$42.412 = \frac{27\pi}{2}$

$\int_0^3 2\pi (x+1)(3x-x^2)\, dx$

Find the volume using the shell method



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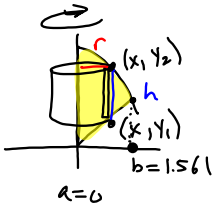
The region bounded by the curves y = 4-x^2, y=x and x=0 is revolved about the y-axis to form a solid. Use shells to find the volume of the solid.



$\int_a^b 2\pi r h \, dx$

$r = x$

$h = y_2 - y_1 = 4 - x^2 - x$

$\int_0^{1.561} 2\pi \cdot x \left(4-x^2-x\right) dx$

13.328

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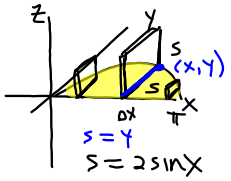
Other cross sections

The base of a solid is the region between the x-axis and one arch of the curve y=2sin(x). Each cross section cut perpendicular to the x-axis is a square whose edge runs from the x-axis to the curve.

vertical



$\Delta V = s \cdot s \cdot \Delta x = s^2 \Delta x$

$V = \int_0^{\pi} s^2 \, dx$

$V = \int_0^{\pi} (2\sin x)^2 \, dx$

$V = 2\pi$

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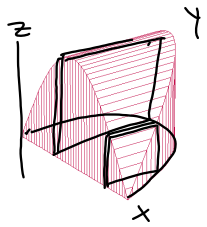
Find the volume



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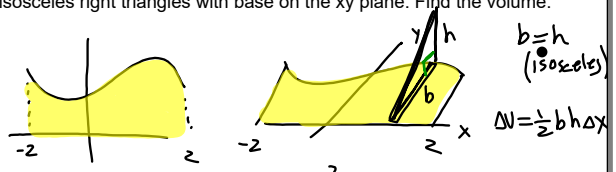
The base of a solid lies between y=2+xcos(x) and the x-axis from x=-2 to x=2. The cross sections perpendicular to the x-axis are isosceles right triangles with base on the xy plane. Find the volume.



$b = 2 + x\cos x$

$\int_{-2}^{2} \frac{1}{2} b h \, dx$

8.344

$\int_{-2}^{2} \frac{1}{2}(2 + x\cdot\cos x)^2 \, dx$

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